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A SURVEY TO EVALUATE WOOD BORERS IN GREEN ASH WINDBREAKS IN NORTH DAKOTA

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ABSTRACT

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Green ash windbreaks in North Dakota were surveyed in 1972 and 1976 to determine the incidence of attacks by the carpenterworm, ash borer, and other stem-infesting wood borers. Windbreaks were stratified by age and geographic region. In 1976, about 3.1 percent of the green ash trees in North Dakota had new carpenterworm attacks, an increase of 34.8 percent from 1972. The number of trees showing new attacks by the ash borer declined in three out of four land resource areas (LRA). Trees damaged by other borers declined in all LRA's but one.

Although some LRA's showed minor increases, the number of windbreaks infested by the carpenterworm and ash borer declined by 41.6 percent and 19.6 percent respectively.

Younger windbreaks were apparently more susceptible to attack by ash borers while older ones were more frequently infested by the carpenterworm and other borers.

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INTRODUCTION

The ash borer, Podosesia syringae (Harris) and carpenterworm, Prionoxystus robiniae (Peck) are common pests in shelterbelts throughout North Dakota. In southwestern North Dakota, attacks by these insects have been severe enough to limit planting of green ash, Fraxinus pennsylvanica Marsh. Both species cause injury to trunks and branches by boring tunnels. When numerous, their tunneling weakens stems, causing them to break in the wind or under a snow load. Larvae feed on the cambium and often girdle the stem. Tunnels are kept open allowing access to moisture, disease, and other insects. This damage often is not obvious for many years.

In 1972, the incidence of borer damage in green ash shelterbelts was surveyed in North Dakota (Tunnock and Tagestad 1973). From 22 to 26 belts in each of four age classes were examined for borer damage. Further stratification was based on major land resource areas as defined by Austin (1965). Ash borers and carpenterworms were present in 51 and 28 percent of the belts, respectively. The carpenterworm was the most common borer in trees over 16 years of age. Borer damage was most severe in the southwestern quarter of the State. Damage was negligible throughout the rest of the State. Presently, the carpenterworm is considered a minor problem in the eastern half of North Dakota. However, the wide distribution of the ash borer makes it a potential threat to windbreak management throughout the State.

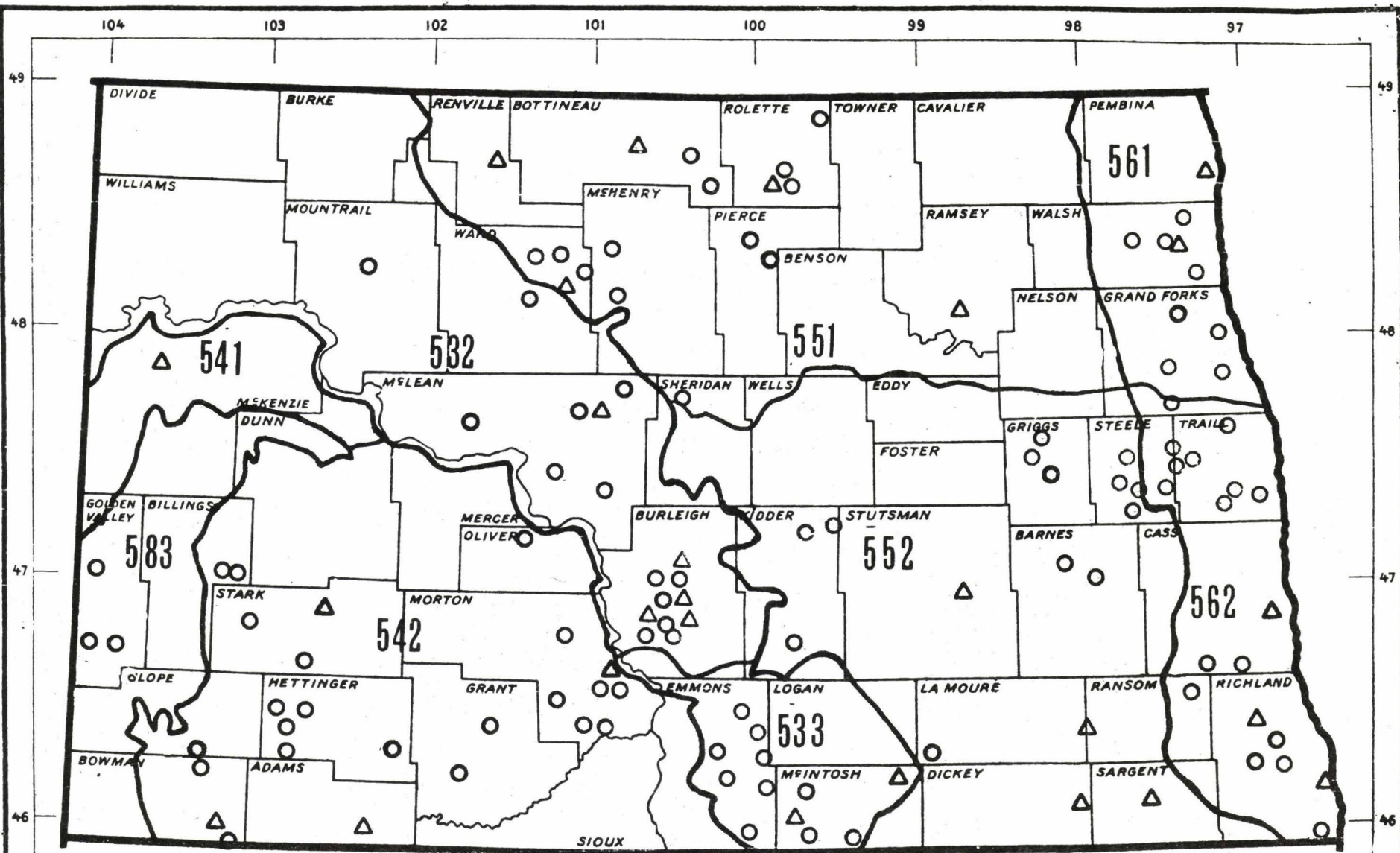
In 1976, this followup survey evaluated the trend in damage caused by these two insects in green ash windbreaks.

METHODS

This survey was conducted as described by Tunnock and Tagestad, (1973). We re-examined the 96 windbreaks surveyed in 1972 and added some new windbreaks in each age class. The following age classes of windbreaks were examined in 1972 and 1976:

Age class (years)	-----1972-----		-----1976-----	
	<u>No. windbreaks</u>	<u>No. trees</u>	<u>No. windbreaks</u>	<u>No. trees</u>
0- 6	24	1,009	29	1,277
7-15	24	954	31	1,238
16-30	26	1,045	35	1,370
31+	<u>22</u>	<u>1,088</u>	<u>27</u>	<u>1,180</u>
Total	96	4,096	122	5,065

We stratified the 1972 survey using a classification of the major land resource areas in North Dakota (Austin 1965). In 1976, we used Cunningham's (1975) refinement of this method where regions were classified into provisional tree and shrub seed zones. The locations of the windbreaks surveyed are shown in figure 1.



Major Land Resource Areas

Figure 1.--Approximate locations of windbreaks examined for green ash borers in 1976

○ Windbreaks surveyed in 1972
and 1976

SCALE - STATUTE MILES
0 20 40 60 80

△ Additional windbreaks surveyed
in 1976

RESULTS AND DISCUSSION

Table 1 presents data on old and new borer attacks by seed zone and compares statewide totals for 1972 and 1976. The number of trees with new attacks by carpenterworms and ash borers increased significantly. However, when old attacks are included, the total number of attacked trees in North Dakota declined. This is primarily due to an 86 percent decrease in the number of trees with old carpenterworm attacks. Two explanations for the sharp decline are: (1) the misidentification of new carpenterworm attacks as ash borer attacks and (2) callusing over of old carpenterworm attacks.

Table 1.--Percentage of sample trees attacked by borers in nine provisional tree and shrub seed zones, 1976

Provisional tree & shrub seed zone	No. of trees examined	Percent of trees attacked by borers						Trees attacked by other borers	Total trees attacked by borers
		Carpenterworm attacks			Ash borer attacks				
		Old	New	Total trees	Old	New	Total trees		
532	770	0.5	1.6	1.8	0.3	1.8	1.9	0.9	4.7
533	430	1.2	1.9	2.8	10.5	11.6	17.0	0	18.8
541	45	0	0	0	0	0	0	0	0
542	1,092	1.0	10.3	9.2	1.1	3.8	4.4	.5	14.7
551	710	0	1.4	.1	.8	1.3	1.7	1.4	3.1
552	711	2.5	2.1	3.8	3.2	1.8	4.6	2.7	11.0
561	425	2.4	.9	3.2	0	.2	.2	.5	4.0
562	794	0	0	0	.1	.9	1.0	1.0	1.9
583	88	0	8.0	8.0	0	0	0	1.1	8.0

An increase in the number of trees with new borer attacks occurred in two areas (table 2). In area 53, attacks by all borers increased substantially. This was due to a modest increase in trees attacked by the carpenterworm and a substantial increase in those attacked by the ash borer. In area 55 a large increase in the newly attacked trees occurred also. Here, the trees infested with carpenterworms and "other borers" more than made up for the decline in ash borer infested trees.

The number of infested trees declined in areas 54 and 56. Despite the overall decline in area 54, the number of carpenterworm-infested trees increased. Carpenterworm infested trees increased 100 percent in area 56, but a decline in the number of ash borer and "other borer"-infested trees offset the gain resulting in an overall reduction.

Table 2.--Comparison of percent^{1/} of trees with new borer attacks by geographic region^{2/}, 1972 and 1976

Land resource area Provisional tree and shrub seed zone	No. trees examined	Percent trees with new borer attacks			
		Carpenterworm	Ash borer	Other borers	Total borers ^{2/}
53 (1972)	952	1.1	1.8	1.4	5.5
532-533 (1976)	1,200	1.7	5.3	.6	9.9
54 (1972)	1,117	7.3	4.5	1.4	29.1
541-542-583 (1976)	1,225	9.7	3.4	.6	13.7
55 (1972)	1,044	.0	1.9	.9	4.0
551-552 (1976)	1,421	1.1	1.5	2.0	7.0
56 (1972)	983	.3	1.1	1.0	3.5
561-562 (1976)	1,219	.6	.7	.8	2.6

^{1/} Geographic region refers to either Austin's Major Land Resource Areas (53-56) or Cunningham's Provisional Tree and Shrub Seed Zone (532-583). Resource areas and seed zones grouped together cover approximately the same land area.

^{2/} Rows are not additive because some trees were attacked by all classes of borers.

Table 3 shows the percent of trees infested by age class. The frequency of carpenterworm attacked trees declined in all but the 7- to 15-year age class where a 100 percent increase was recorded. Ash borer attacks by age class maintained their relative position when compared to the 1972 survey. The number of infested trees increased in the 7- to 15-year and in the 31+ year age classes, but the younger age classes were still most frequently attacked.

Table 3.--Percentages of sample trees by age class attacked by borers, 1972 and 1976

Age class Years	No. of trees Examined		Percent windbreaks attacked by					
	1972	1976	Carpenterworm		Ash borers		Other	
	1972	1976	1972	1976	1972	1976	1972	1976
0- 6	1,009	1,227	0.5	0	4.7		3.4	0.1
7-15	954	1,238	3.0	6.0	5.8		7.8	0.2
16-30	1,045	1,370	14.1	3.0	3.0		2.6	0.5
31+	1,088	1,180	10.4	6.0	1.1		1.4	4.0
Total	4,096	5,065	7.2	4.0	3.5		3.8	1.2

The number of borer infested windbreaks declined except for an increase in the number of belts in the 7- to 15-year age class infested by the ash borer (table 4). When analyzed on the basis of geographic region, the number of infested windbreaks declined or remained static (tables 5 and 6).

Table 4.--Percentage of examined windbreaks by age class damaged by borers, 1972 and 1976

Age class	No. of windbreaks examined		Carpenterworm		Ash borer		Other borers	
	1972	1976	1972	1976	1972	1976	1972	1976
0- 6	24	29	12.5	0	58.3	37.9	4.2	0
7-15	24	31	29.2	19.4	58.3	61.3	8.3	3.2
16-30	26	35	34.6	22.9	50.0	37.1	15.4	11.4
31+	<u>22</u>	<u>27</u>	<u>36.4</u>	<u>22.2</u>	<u>36.4</u>	<u>29.6</u>	<u>54.5</u>	<u>29.6</u>
Total or Average	96	122	28.1	16.4	51.0	41.8	19.8	10.7

Table 5.--Comparison of the percentage of examined
windbreaks damaged by borers by geographic
regions, 1972 and 1976

Land Resource Area/ Provisional Tree and Shrub Seed Zone	No. examined	Percent windbreaks damaged by		
		Carpenterworm	Ash borer	Other borers
53 (1972)	23	43.5	34.8	17.4
532-533 (1976)	30	16.7	36.7	3.3
54 (1972)	26	53.8	84.6	26.9
541-542-483 (1976)	29	34.5	62.1	13.8
55 (1972)	24	8.3	50.0	20.8
551-552 (1976)	34	8.8	44.1	17.6
56 (1972)	23	4.3	30.4	13.0
561-562 (1976)	29	6.9	20.7	13.8
Total 1972	96			
Total 1976	122			

Table 6.--Percentage of windbreaks damaged by borers
in provisional tree and shrub seed zones, 1976

Provisional tree & shrub seed zone	No. of windbreaks examined	Percent windbreaks damaged by borers		
		Carpenterworms	Ash borers	Other borers
532	18	11.1	22.2	5.6
533	12	25.0	58.3	0
541	1	0	0	0
542	25	36.0	72.0	12.0
551	17	5.9	35.3	17.6
552	17	11.8	52.9	17.6
561	10	20.0	10.0	10.0
562	19	0	26.3	15.8
583	3	33.3	0	33.3
Total Statewide	122	16.4	41.0	12.3

In conclusion, while the area infested by borers has generally decreased throughout North Dakota, their numbers are increasing in local areas where conditions are more favorable.

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